MANUFACTURING TECHNOLOGY ACCELERATION CENTER (M-TAC) PILOT PROJECTS

Report on Initial Progress and Learning

February 2015

MEP • MANUFACTURING EXTENSION PARTNERSHIP

National Institute of Standards and Technology

Executive Summary

In 2014 the Hollings Manufacturing Extension Partnership (MEP) Program, led by the National Institute of Standards and Technology (NIST), initiated five pilot projects to explore different approaches to the provision of MEP technology acceleration assistance for small U.S. manufacturers – set within the context of specific supply chains. These Manufacturing Technology Acceleration Center (M-TAC) pilot projects bring together teams of experts in specific technology and supply chain areas to offer small manufacturers an array of services and deep expertise relating to technology acceleration, transition, and commercialization.

Studies show that small manufacturers often lack the staff, technical expertise, and general wherewithal to stay abreast of emerging technologies and processes. This creates a gap between the technologies and technological approaches to manufacturing that constitute the innovations that drive supply chains, and the readiness of many small manufacturers to adopt these emerging and existing and technologies.
Working with specific supply chains to understand their technological needs and trends, the M-TAC pilot projects identify where manufacturers most need assistance in adopting or adapting technology. The projects test and demonstrate business models that will allow small manufacturers to access the technology transition and commercialization services they need to most effectively compete within those supply chain markets. The M-TAC Pilots provide insight into the approach that MEP should follow going forward on a national scale as it seeks to positively impact small U.S. manufacturers in these two critical areas of technology acceleration and supply chain development.

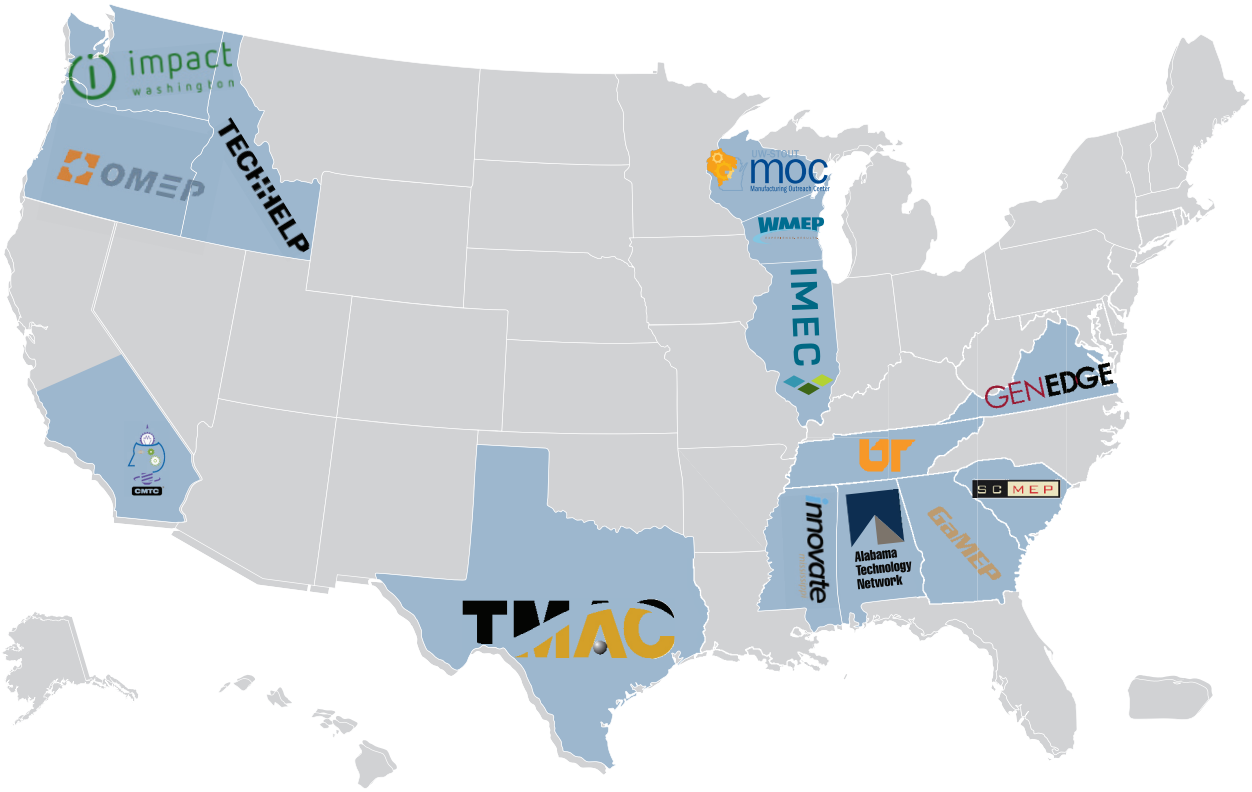
Started with a 2014 NIST MEP investment of approximately $2.5M, the M-TAC Pilots are all led by MEP Centers. With 5 lead Centers from the states of CA, GA, OR, TX, and WI; along with participation from an additional 9 Centers from the states of AL, ID, IL, MS, SC, TN, VA, WA, and WI; along with many other subrecipient and partner organizations, the M-TAC Pilots focus on the intersection and interdependence of MEP's strategic focus on technology acceleration and supply chain development. Operational for a duration of just under 2 years in 2014 and 2015, the M-TAC Pilots cover a broad geographic footprint and a diverse portfolio of manufacturing supply chains – see Figure 1, the M-TAC Pilot MEP Center Footprint, on the following page.

The following five projects, led by the following five MEP Centers, are operating as M-TAC Pilots:

- Defense and Aerospace M-TAC, led by the Texas Manufacturing Assistance Center (TMAC, the MEP Center in TX)
- Food and Beverage Processors M-TAC, led by the Oregon MEP (OMEP, the MEP Center in OR)
- Great Lakes M-TAC, led by the University of Wisconsin – Stout Manufacturing Outreach Center (UW-Stout MOC, one of the MEP Centers in WI)
- Transportation M-TAC, led by California Manufacturing Technology Consulting (CMTC, one of the MEP Centers in CA)
- Southeast Automotive M-TAC, led by the Georgia MEP (GaMEP, the MEP Center in GA).

MEP Centers Participating in M-TAC Pilot Projects

Figure 1.



This report presents a summary of initial progress and learning from these 5 M-TAC pilot projects, based upon project operations from March – September 2014.

Project Summaries

Defense/Aerospace Supply Chain M-TAC

This project is led by the Texas Manufacturing Assistance Center, and MEP Center project partners include all seven of TMAC's MEP service locations. The project is working with a Defense/Aerospace-related innovation ecosystem in Texas. It is identifying ecosystem gaps and strategies to fill those gaps, and mapping differentiated research, advanced technology, and intellectual property resources for Defense/Aerospace and related supply chains within Texas. The project is also identifying and providing an array of technical assistance to high-potential prospect manufacturers as participants in these Defense/Aerospace supply chains.

TMAC

Food & Beverage Processors M-TAC

This project is led by Oregon MEP, and MEP Center project partners include Impact Washington and Idaho TechHelp. The Food & Beverage Processors M-TAC is working with the Northwest Food and Beverage Processors Association to identify technical and business challenges faced by small manufacturers in the food processing supply chains of the northwest U.S., and also identify new product and process technologies appropriate to these challenges. Through online Emerging Technology Showcases, vetted technology products or services are virtually introduced to small manufacturer food processing suppliers, who will then be assisted in adopting those technologies.

Great Lakes M-TAC

This project is led by the University of Wisconsin-Stout Manufacturing Outreach Center, and MEP Center project partners include Wisconsin MEP. The pilot targets the specific needs of key Wisconsin driver industries, and corresponding existing and emerging supply chains, to access and apply advanced manufacturing technology acceleration services that propel small manufacturer to be globally competitive. The targeted "driver" industry supply chains include those for transportation equipment; electrical equipment manufacturing; pulp, paper, and paperboard mills; dairy product manufacturing; and foundries.

Southeast Automotive M-TAC

This project is led by Georgia MEP, and MEP Center partners include the Alabama Technology Network, Innovate MEP Mississippi, South Carolina MEP and Tennessee MEP. The project is working with state Automotive Manufacturer Associations and automotive OEMs in the Southeast U.S. to determine technology needs of the automotive supply chain. The project uses available MEP tools and services to identify potential R&D capabilities in the nation relative to the identified technology needs, and chronicle opportunities and challenges of effectively connecting small manufacturer automotive suppliers with R&D capabilities and available technologies.

Transportation M-TAC

This project is led by California Manufacturing Technology Consulting (CMTC), and MEP Center partners include GENEDGE Alliance (VA), the Illinois Manufacturing Excellence Center, and the Corporation for Manufacturing Excellence (CA). The project addresses the Transportation Equipment Manufacturing supply chain, encompassing industries such as automotive, aerospace, trucking, shipping and rail. The 7project takes a systems view of technology needs within these supply chains by working with Top/Mid-Tier manufacturers to identify their needs and the needs of small manufacturers within their supply chains. The project also then directly works with the supply chains' small manufacturers to provide awareness about the needs of Top/Mid Tiers, as well as assistance in implementing specific technologies.

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Highlights of the Initial Progress

During 2014, the five M-TAC Pilots worked with small and large manufacturers, manufacturer and industry associations, universities, federal laboratories, capital and financing organizations, and other organizations relevant to project efforts. The M-TAC Pilots have already conducted, and are in the process of planning and conducting, specific technology transition and commercialization projects with collaborators from different combinations of these organization types and working with different supply chains. The Pilots have conducted research relating to technologies, supply chain needs, and technology transition and commercialization opportunities, as well.

The purpose of these M-TAC Pilots is to explore different approaches to providing manufacturers with the technology transition and commercialization assistance they need to compete successfully and grow their market share within manufacturing supply chains. As such, M-TAC Pilot success is measured by knowledge obtained that helps lay the groundwork for the definition of an appropriate role for MEP in this area. This acquisition of knowledge through exploration is more important to the M-TAC efforts than a pre-determined set of metrics associated with elements such as technologies examined, partners engaged, or instances of assistance provided. Therefore, the progress highlights reported herein are intended to communicate initial learning cultivated thus far via these M-TAC Pilots.
This report summarizes knowledge obtained by the M-TAC Pilots during their 2014 operations in terms of the following primary areas:

- Technology Transition and Commercialization Tools and Services
- MEP Role in Supply Chains
- Business Model
- Partners and Resources
- Amplification of MEP Center Technology Acceleration and Supply Chain Development Efforts

These are the areas that the M-TAC Pilots set out to explore (at the direction of NIST MEP) when they were initiated in 2014. They are primary areas where insight is critical to help define and demonstrate an appropriate role for MEP to play with respect to the intersection of technology acceleration and supply chain development.

Technology Transition and Commercialization Tools and Services

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The following sections provide examples that highlight M-TAC Pilot Project learning in these areas. The M-TAC Pilots are demonstrating that manufacturer needs relating to technology transition and commercialization, within the context of supply chains, are broad and diverse. They can range from needing to identify a new technology to automate a labor-intensive process; to implementing a new approach for designing and producing manufactured products to streamline product and process data exchange throughout a supply chain; to connecting a market need to an emerging technology – and everything in between. A significant insight from these Pilots is that manufacturer assistance needs to be well-defined, discrete, and consumable by the manufacturers. And it must clearly demonstrate the value that it adds to the manufacturer.

Sample highlights from the M-TAC Pilots relating to Technology Transition and Commercialization Tools and Services are provided below.

The Southeast Automotive M-TAC, led by GaMEP, is investigating innovative automotive technology developed for auto industry applications, along with an understanding of the needs of the auto supply chain in the southeastern U.S. states. The Pilot is also learning the readiness of the supply chain to adopt or implement emerging technologies. In the space of technology transition and commercialization, this M-TAC Pilot is approaching its learning through a series of interactions and interviews with technology sources, along with a representative sample of the auto supply chain, from OEMs to Tier 3 suppliers, with a target of 150 interviews and interactions conducted over the course of project operation.

Thus far, the M-TAC Pilot has conducted and documented 48 interactions with manufacturers in the automotive supply chain, to include 7 OEMs operating in the southeast, as well as 41 suppliers. Additionally, the Pilot has interacted with 30 other organizations, including technology sources, industry associations, and research entities. The Pilot has learned that process technology is the biggest need and that technology transition has good success potential when it is based upon a simultaneous push of available technology, combined with a pull from the market with the need for technology.

A service offering provided by MEP Centers that is a good match here is Technology Scouting. Technology Scouting is an MEP service that helps manufacturers systematically identify technology solutions to growth or competitiveness opportunities. Technology Scouting can be a good tool for methodically and fundamentally articulating a technology need, and in turn identifying a set of possible solutions that might be explored to solve the problem.

The Great Lakes M-TAC, led by the University of Wisconsin Stout Manufacturing Outreach Center, is deploying technology acceleration services to small manufacturers operating as suppliers to different industries around the Great Lakes region by using a pull approach. The Pilot approaches manufacturers to understand their technology-related issues and opportunities, and then applies different services to solve issues that are uncovered. During its initial period of performance, this Pilot has worked with 44 manufacturers, deeply explored the provision of services with about 25% of them, and conducted projects with about 10%. From these manufacturer interactions, tools and assistance that are emerging as useful mechanisms of assistance to manufacturers include Technology Scouting, Right and Ready evaluations, and Innovation Services as a complement or prelude to a technology acceleration / implementation effort. Right and Ready evaluations determine whether a company's need can appropriately be addressed via MEP Technology Acceleration services, and Innovation Services help define the front-end product and market possibilities for a manufacturer's growth and competitiveness needs.

Thus far, the M-TAC has learned that technology transition is a "hit or miss" with companies. Companies tend to be reluctant to receive external services for technology solutions, in part due to the fact that many companies underestimate the cost of living with problems, versus the cost of solving them.

MEP Role in Supply Chains

MEP Supply Chain Development applies to the operations and needs of overall supply chains, as well as individual manufacturers operating as suppliers within supply chains. A learning of these M-TAC Pilots is that a logical interface between technology and supply chains occurs when supply chains provide the market pull for technologies to either be commercialized or adopted within a manufacturer's commercial application. Different aspects of technology and supply chain push and pull are relevant and must be considered when offering assistance to manufacturers in the space where technology and supply chains intersect.

Sample highlights from the M-TAC Pilots relating to the MEP Role in Supply Chains are provided below.

The Transportation M-TAC, led by CMTC, is working with OEM and Tier 1 level transportation equipment manufacturers and their U.S. suppliers, to understand the technology needs of these supply chains and collaboratively deploy specific technologies throughout the various tiers of the supply base. With the objective of developing a U.S. manufacturing supplier base that is more competitive in the global market, this M-TAC is initially working with a space and intelligence systems supply chain, as well as an automotive supply chain.

For the space and intelligence systems supply chain, the technology focus being driven from the major aerospace OEM with whom the Pilot is partnering is the use of model-based definition approaches for the design and production of supply chain products to improve the control of design and production data throughout the supply chain. For the automotive supply chain, the technology focus that was identified by an automotive industry suppliers trade association and is being driven by a major automotive OEM is material management operations guideline / logistics evaluation for improved visibility throughout the supply chain into materials management and logistics.

By working to deploy specific technologies throughout these supply chains from the OEMs and Tier 1s, down to the lower-tier suppliers, the MEP Centers are demonstrating real value in the following areas: developing the supply chain vision and technology plan, engaging the supply chain, and transitioning and commercializing technology to the supply chain.

The Northwest Food and Beverage Processors M-TAC, led by OMEP, is working closely with food and beverage processors to facilitate improved process and product flow between suppliers and customers. An industry steering committee has been established by this M-TAC Pilot and is operating to identify technical and business challenges faced by small- and medium-sized processors, and to identify technologies to meet these challenges. Where cutting-edge technology is being adopted by small food and beverage processors, an appropriate role for MEP Centers is to facilitate the relationship between the adopting manufacturer and the technology supplier (whether it's a business or research institution). MEP assistance to the small Food and Beverage Processors can include any combination of assisting with the specifics of the technology implementation, or connecting to appropriate third party resources for that assistance, and providing project management assistance to the manufacturer throughout.

Additionally, the MEP Centers operating in the northwest region of the U.S., through this M-TAC Pilot, are working with the Northwest Food and Beverage Processors Association to identify industry-wide technology-related challenges and potential solutions. By serving as a convener of the relevant organizations within food processing supply chains in this region, MEP is facilitating awareness of new approaches being taken by small Food and Beverage Processors with a sense of a priori buy in throughout the supply chain. The Pilot is planning to conduct 10 technology adoption and transfer projects with Food and Beverage Processors in the northwest U.S. Thus far, 1 project has been completed and several are in process. Over a dozen leading-edge technologies relevant to improved competitiveness of Food and Beverage Processors have been explored thus far in conjunction with these food processor projects, with many more planned.

Business Model

The M-TAC Pilots are demonstrating that Business Model can have a complex and diverse meaning. Business models can apply to the financial underpinning associated with the provision of technology transition and commercialization services from an MEP Center to a manufacturer; it can refer to the financial basis by which a manufacturer operates within a supply chain; it can refer to the capital and financial resources applied to the commercialization of technology; and it can have many other meanings as well.

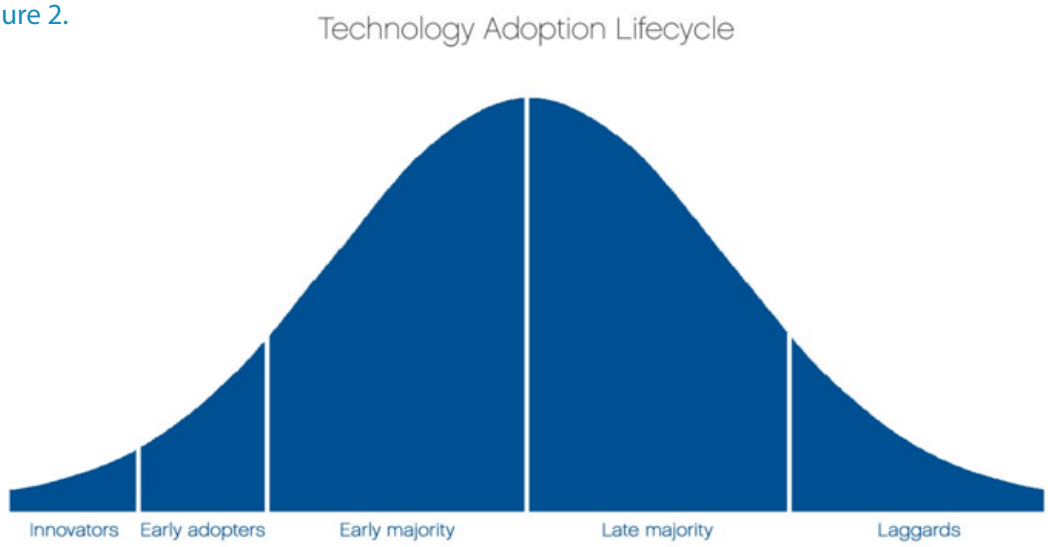
The M-TAC Pilots are demonstrating that financial resources, which can be significant, are required to provide technology transition and commercialization services within the context of supply chains. MEP services in this area must be sustainable from a business perspective, and an undeniable truth is that manufacturers will invest in their business – regardless of the specific focus or aspect – only when a definite, appropriate return on the investment is apparent.

Sample highlights from the M-TAC Pilots relating to Business Model are provided below.

The Aerospace and Defense M-TAC, led by TMAC, is emphasizing selection of appropriate manufacturing companies as clients in this space, combined with a holistic approach to serving their needs. An interesting Business Model related aspect of the Pilot relates to marketing and services offered to M-TAC clients. The Pilot is examining the premise that the use of analytics, longitudinal microeconomic databases, and rigorous screening can help proactively identify companies that likely to either grow disproportionately and/or benefit most from MEP assistance services in this space of supply chain technology acceleration. Such high growth potential companies should be those that are targeted for M-TAC services. Thus far, this Pilot has 55 emerging technology manufacturers for interactions and meetings with leading Aerospace and Defense prime contractors who are collaborators in the Pilot.

Early observations show that MEP Centers can apply the Technology Adoption Lifecycle to a company product set to help match different types of marketing and associated service portfolios to potential clients. (The Technology Adoption Lifecycle describes the adoption/acceptance of a new product or innovation according to the demographic and psychological characteristics of defined adopter groups. The premise is that the adoption of an innovation occurs as a normal distribution over time, and can be segmented into groups as detailed in Figure 2 below.)

Figure 2.



The Technology Adoption Lifecycle was developed by Joe M. Bohlen, George M. Beal and Everett M. Rogers at Iowa State University built on earlier research conducted there by Neal C. Gross and Bryce Ryan.

The Northwest Food and Beverage Processors M-TAC, led by OMEP, is working with a collection of partners and in conjunction with its Industry Steering Committee to identify and showcase emerging technologies that represent promising potential solutions to meet defined technical and business challenges. The M-TAC Pilot is conducting a small series (2) of emerging technology showcases as internet "TV shows" in which vetted technology products that are relevant to industry-defined priority technology needs for food and beverage processors, are virtually introduced to showcase participants (current/prospective supply chain companies), who can then be assisted in adopting those technologies into their products and processes.

Three factors are central to the successful conduct of M-TAC emerging technology showcases: a portfolio of business relationships necessary to define the priority technology areas, supply the technologies to showcase, conduct outreach to suppliers as participants willing to consider receiving the showcased technologies; MEP Centers with the expertise and/or service provider connections needed to assist companies in the areas where they need assistance relating to their technology adoption / implementation; and a budget to conduct the emerging technology showcases.

Amplification of MEP Center Technology Acceleration and Supply Chain Development Efforts

MEP Centers are actively engaged in the provision of technical and business assistance services to U.S. manufacturers in several strategic areas, among which are technology acceleration and supply chain development. Significant time and investment has gone into the development of approaches and services being deployed by MEP Centers in these areas. The M-TAC Pilots are testing the premise that a significant opportunity exists to provide impactful assistance to manufacturers at the intersection of technologies and supply chains.

The M-TAC Pilots are demonstrating that working with manufacturers to address their growth and competitiveness needs and issues at the technology-supply chain intersection not only does not interface with existing MEP efforts in these area – but rather can provide significant augmentation to these services.

Sample highlights from the M-TAC Pilots relating to the Amplification of MEP Center Technology Acceleration and Supply Chain Development Efforts are:

The Southeast Automotive M-TAC and Great Lakes M-TAC are both engaged in efforts that are heavily reliant upon Technology Scouting as an integral component of being able to successfully provide assistance to small manufacturers at the intersection of technology acceleration and supply chain development. Both of these Pilots are seeing significant opportunities to serve the competitiveness needs of small U.S. manufacturers through this mature MEP service that can be a catalyst to combine with other services to provide fairly comprehensive solutions to manufacturer issues where technology is a critical component of increasing supply chain competitiveness and market share.

The Transportation M-TAC is integrating MEP Supply Chain Optimization work and services into the Pilot approach because technology adoption for small manufacturers plays an important role in producing more valuable and productive supply chains. Engagement efforts where both technology and supply chain development needs are the focus can lead to robust opportunities for MEP Centers to offer small manufacturers assistance at the intersection of technology acceleration and supply chain development.

The Defense and Aerospace M-TAC is applying a holistic approach to technology acceleration assistance for small manufacturers in Texas. The Pilot engages small manufacturers at the company executive level, and it focuses on cultivating a robust innovation ecosystem for Texas manufacturers that are necessarily industry- and supply chain-specific. With this approach, the Pilot allows MEP to integrate offerings of talent, technology, capital, and extended know how with traditional MEP offerings that address the "blocking and tackling" needs of small manufacturers. In doing so, MEP is providing holistic suites of services focused on greatly accelerating small manufacturer growth.

The Food and Beverage Processors M-TAC is demonstrating new and enhanced delivery mechanisms for MEP's technology acceleration service offerings. With its focus on a specific supply chain and through the partnerships established via the M-TAC, the Pilot allows MEP to provide food and beverage processors a robust array of services to assist them to integrate, adopt, transition, and commercialize product and process technologies into their operations to help them grow and compete. The Pilot is also acting as a test for MEP assistance in the space of transferring new technologies from research universities and entrepreneurs into an industrial supply chain.

Partners and Resources

Supply chains generally cover wide geographic areas. They operate across regions, states, on a nationwide basis, and internationally. To be an effective provider of value-adding, custom solutions to small manufacturers operating in supply chains and seeking to transition and commercialize technology to their business benefit, it is beneficial for an M-TAC Pilot to have a broad and diverse array of partners. Such partners can allow access by the manufacturers being served to the resources needed to appropriately transition and commercialize technology at manufacturers, set within the context of supply chains.

As such, the following partners are critical to success in providing small manufacturers with technology transition and commercialization assistance within the context of specific supply chains:

- **Multiple MEP Centers** – to allow hands-on direct technical and business assistance to be provided to different suppliers operating in different geographic regions to effect improvements to supply chains as entities, versus individual companies.
- **Third Party Service Providers** – to complement the MEP service offerings to manufacturers when the manufacturer needs go beyond what is available from MEP as technical assistance
- **OEMs and Tier 1 Manufacturers** – to provide insight into top-of-the-supply chain perspectives on pressing supply chain technology needs and technological perspectives, as well as identification of small manufacturers operating within supply chains
- **Industry and/or Supply Chain Organizations** – to provide insight into industry-wide issues, as well as access to manufacturers of all sizes and types operating within specific industries
- **Capital and Financing Organizations** – to provide manufacturers access to capital and/or financing options when their technology transition and commercialization path requires such access
- **Technology Sources** – research laboratories (private, federal, and university), entrepreneurs and innovators, hardware equipment vendors, software vendors, and systems integrators all serve as sources of discrete technology, technical know-how, and commercially available products that are frequently the central aspects of the solutions to manufacturer needs and opportunities.

Sample highlights from the M-TAC Pilots relating to Partners and Resources are provided below.

- The Southeast Automotive M-TAC actively involves participation from the MEP Centers operating in five southeastern states: GA, AL, MS, TN, and SC; participation from the state automotive manufacturing associations from these same 5 states; nearly a dozen individual automobile OEMs operating in these 5 states; a national automotive research center from MI; one of the Institutes for Manufacturing Innovation operating out of Chicago as part of the National Network for Manufacturing Innovation; and research and development laboratories from various universities in the southeast.

- The Aerospace and Defense M-TAC is based upon the provision of assistance services within a regional ecosystem that contains the resources needed for supply chain technology acceleration success. As such, partners from this Pilot include large defense OEMs; NASA as a non-defense aerospace supply chain driver; university research laboratories as technology sources; each of the 7 regional locations operating as part of the Texas MEP Center; third party service providers to analyze and identify high-growth-potential small manufacturing companies as participants; the venture capital community as a provider of financial resources; local chambers of commerce within Texas; and local and regional technology incubators that focus on helping small startup companies develop emerging technologies into manufactured products.

Summary and Next Steps

The M-TAC Pilots will operate through calendar year 2015. NIST MEP will continue to monitor the Pilots for lessons learned, as well as tool and assistance service development, applicability, and readiness, and disseminate results widely throughout the nationwide network of MEP Centers and other relevant stakeholder groups, including policy makers at the state and Federal levels.

M-TAC Pilot results will provide valuable insight for broader supply chain initiatives at the state and federal levels. These Pilots will benefit not only the manufacturing assistance efforts of other MEP Centers, but also the manufacturing clients served by the MEP Program. The Pilots are significant contributors to the development of the approaches that will be deployed by the nationwide network of MEP Centers to provide U.S. manufacturers assistance as they transition and commercialize technology within the context of manufacturing supply chains.

A final report of the M-TAC Pilots will also be available after the conclusion of these efforts.

Headquartered in Gaithersburg, MD, the National Institute of Standards and Technology's Hollings Manufacturing Extension Partnership is a public/private partnership that works with small and mid-sized U.S. manufacturers to create and retain jobs, increase profits, save time and money, develop new customers, and expand into new markets.

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